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THE ROLE OF STATISTICAL INFORMATION IN
NATIONAL INFORMATION SYSTEMS

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INTRODUCTION

At its third session, the Joint Conference of African Planners, Statisticians and Demographers requested the ECA secretariat to ascertain the importance given to statistical data in national information systems and the statistical organization problems encountered in the region. The request was in line with the guidelines set forth in the Lagos Plan of Action (LPA).

This document has been prepared in response to that request. In order to better highlight the importance accorded to statistical information in national information systems, an attempt has first been made to identify the characteristics of such systems where they are mainly geared to economic and social development and later to underscore the contribution of statistics as an information system. Statistical organization problems encountered in the region have been dealt with in this document on the basis of the use made of the statistical information system to monitor and evaluate the implementation of LPA.

I. GENERAL CHARACTERISTICS OF NATIONAL INFORMATION SYSTEMS

Definition

The concept of an information system derives from that of information. Generally speaking, information is an abstract formulation that describes the state of an element which can change with time. The current terminology refers to this as a datum. Information therefore refers to an accumulated set of data concerning facts, people and so on. Three main groups of data may be distinguished: socio-economic data; scientific and technological data and natural resource data. All such data are expressed either in words (bibliographical data for example) or in figures. In the latter case, the notion "numerical" must be distinguished from the notion "statistical". To be effectively used, such data are generally organized into systems, that is to say, structurally coherent sets whose elements perform a function that depends on the nature of the information, the set objective, the existing or potential user and the types of decision.

Role

Information systems are set up to inform members of an organized society, individually or collectively, about the environment in which they operate, for purposes of information, control, forecasting and the like. In particular, the information systems used by the public authorities of a country generally have two objectives: To support routine decisions taken in civil service administration. Such administrative or management information systems are made up of files, most often computerized, established within such departments as the Inland Revenue, Social Security, Public Health, Education, Public Works and Justice.

In carrying out their functions, these departments generate what is termed operational information: To support the making of decisions which play a role in economic and social development. The fact is that without securing access to several categories of information, solutions cannot be found to development problems. For example, planning in the industrial sector requires data on manpower, natural resources, existing industries, available technology, domestic and foreign market prices. Similarly, manpower policy-making requires information on population, the labour force, technology and existing or proposed industries. Finally, planning for natural resources requires data on such factors as the resources themselves, existing or proposed industries, transport and manpower. An inter-relationship therefore exists between the types of data needed to take decisions and the key areas of development, and hence the information needed to take rational decisions for development should be

integrated into such information systems as these statistical information systems which are said to be geared to supplying data to the various agents in economic and social life.

Structure

6. Any information system needs four types of apparatus:

- an observation and measurement apparatus with which data on the physical and human environment can be collected. The main tools in such an apparatus are the methods whereby observation operations are programmed and the validity of the results guaranteed;

- an apparatus for analysis. One function of such an apparatus will be to produce data on the basis of other data. Three types of analysis may be distinguished. The first and most simple consists of elementary editing of data and their presentation in written form (lists, tables, graphics). The second type of analysis is descriptive statistics whereby data may be interpreted from a specialized and methodological point of view in terms of reliability, usefulness and other considerations. Finally, there is the use of models (statistical and simulation models) which aggregate data derived from statistical data bases to produce information that helps to size up, diagnose and forecast situations. Models rely on the relationships between variables;

- an apparatus for storing and circulating pooled information to decision-making bodies or to the general public. Such an apparatus draws especially on information science and data base technology;

- An "information on information" apparatus (a meta-information system) whereby users can be provided with the lay-out of the system content and the possibilities for its use. Such an apparatus is especially designed to accompany the quantified information by methodological observations in order to ensure that the information is correctly and properly used.

General conditions of information

7. For it to help in rationalizing decisions or simply to be useful, information should fulfil a certain number of conditions. It should be:

- relevant, that is to say, adapted to the needs of the user. This condition can be met by matching the supply of and demand for information more adequately by means of an on-going dialogue between information users and producers;

- timely, that is to say, available and accessible at the time when the decisions should be taken. Information loses its value when the time it was to be used is past. Outdated information serves no practical purpose.

- accurate, that is to say, reliable and precise. Information is supposed to reflect with sufficient precision the reality of the phenomenon it is supposed to describe. Accuracy of information can be secured through rigorous methods of data collection, control and documentation;

- comprehensive: one correct elementary measurement is not enough. The entire field over which the investigation must be carried out should be covered.

III. THE PLACE OF STATISTICAL INFORMATION IN NATIONAL INFORMATION SYSTEMS

8. As the above brief outline shows, information systems are made up of sets of data and processing modes that fulfil certain specific conditions and have the purpose of informing decision-making. Development-oriented information systems generally focus, both nationally and internationally, on socio-economic, scientific and technological or natural resource phenomena. However, socio-economic information systems happen to be the most widespread, the most developed and the most used, at least by Governments.

9. These are the systems that will be considered in this paper. They have two components: the bibliographical or documentary component and the statistical component. The statistical component has the higher priority because it best responds to the requirements for strategic as well as management decision-making. Collective or individual decisions, whether taken by public authorities, enterprises, local communities, lobbies and associations, or even households, should be enlightened by economic and social information which is largely quantified and expressed in statistical language. Since it applies to all areas of quantitative investigation, statistical information is a description of numerous phenomena or facts which rely on figures.

10. Such a description may concern one or more characteristics (qualitative or quantitative) of the phenomenon under consideration, in all their possible configurations. The units to which the information refers are made up of well-defined and specified sets that can be compared over time and space. In conformity with technical standards for data collection and processing, statistical information has to be reliable and accurate, comprehensive and relevant.

11. No wonder then that economic and social policy-makers and managing administrators depend to a very great extent on statistical information to solve problems and take decisions. Not only does statistical information make it possible to size up a given situation it also enables trends to be interpreted and estimates and projections to be made using advanced techniques in mathematical statistics. To show the importance of statistical data in any national development information system, it will suffice merely to consider the needs of Governments in this area. For a country to be economically viable, not to say prosperous, its government should have a detailed knowledge not only of the people it is serving but also of the agricultural, industrial, trade and other activities from which the people derive their livelihood. Statistical information is one way of securing such knowledge.

12. In particular, statistical information comes more significantly into play when a Government has to plan an economic growth policy and to monitor the effects. Decisions in this area are taken in several stages:

- definition of problems from an evaluation of the current situation;
- identification of development opportunities that will bring about changes in the current situation;
- cost-benefit analysis of the various options open;
- preparation of development proposals, strategies and programmes together with the setting of specified standards;
- systematic monitoring of programmes. All these stages presuppose that access has been secured to integrated statistical data, both aggregated and disaggregated.

13. To illustrate the point, statistical information required for opening up a land-locked region by means of an overland transport infrastructure may comprise:

- aggregate data on the break-down of the investment budget at national level;
- local, regional and national aggregate data for preparing the projects;
- regional and local aggregate data for selecting a project and individual data concerning the plots of land that will be considered in selecting the exact location;
- detailed information on the economic and physical situation of each plot at the time of construction.

14. All this goes to show that in working out problems and identifying opportunities for development, statistical aggregates and a certain amount of technological information are generally required. However, when some measure or series of measures has to be taken, such as the building of a road, school or industrial complex, the information needed tends to be less aggregated.

15. Statistical information is very important, if not fundamental, to the process of development. In order to effect desirable changes, decision-makers and planners set objectives often in the form of numbers based on a quantified rationale that is built up from statistical information. Nor can the monitoring and evaluation of programme implementation and assessment of the impact of programmes on the general development take place without statistical data inputs.

IV. USING THE AFRICAN STATISTICAL INFORMATION SYSTEM TO MONITOR AND EVALUATE THE IMPLEMENTATION OF THE LAGOS PLAN OF ACTION: ORGANIZATIONAL PROBLEMS

16. The Heads of State and Government who met in Lagos on 28 and 29 April 1980 adopted the Lagos Plan of Action and Final Act of Lagos as a framework for implementing the Monrovia Strategy for the development of Africa. The guidelines on which the Lagos Plan of Action is based are as follows:

- (i) Africa's huge resources must be applied principally to meeting the needs and purposes of its people;
- (ii) Africa's almost total reliance on the export of raw materials must change. Rather, Africa's development and growth must be based on a combination of Africa's considerable natural resources its entrepreneurial, managerial and technical resources and its markets (restructured and expanded), to serve its people. Africa, therefore, must map out its own strategy for development and must vigorously pursue its implementation;

- (iii) Africa must cultivate the virtue of self-reliance. This is not to say that the continent should totally cut itself off from outside contributions. However, these outside contributions should only supplement its own efforts, they should not be the mainstay of its development;
- (iv) As a consequence of the need for increased self-reliance, Africa must mobilize its entire human and material resources for its development;
- (v) Each African State must pursue all-embracing economic, social and cultural activities which will mobilize the strength of the country as a whole and ensure that both the efforts put into and the benefits derived from development are equitably shared;
- (vi) Efforts towards African economic integration must be pursued with renewed determination in order to create a continent-wide framework for much needed economic co-operation for development based on collective self-reliance.

17. The Final Act of Lagos is devoted exclusively to co-operation among member States and their integration in all economic, social and cultural fields. The Lagos Plan of Action explicitly identified the following as the fields of importance:

- Food and agriculture
- Industry
- Natural resources
- Human resources development and utilization
- Science and technology
- Transport and communications
- Trade and finance
- Measures to build up and strengthen economic and technical co-operation
including creation of new institutions and strengthening of existing ones
- Environment and development
- The least-developed African countries
- Energy
- Women and development
- Development planning, statistics and population

18. Each of these areas comes under a number of objectives or directives that can be measured more or less directly in statistical terms. Since the LPA is currently being implemented, the task now is to monitor and systematically evaluate its implementation. Unquestionably, this is one essential point of the LPA. Indeed, the system for monitoring and evaluating the implementation of the Lagos Plan of Action and the Final Act of Lagos should be designed and formulated as an integral part of the economic and social development of African countries and applied as a continual process both nationally and internationally.

19. There are two main reasons for this: the first is the need to determine in what manner national development plans and programmes conform to the provisions of the LPA; the second is to ensure the continued collection of the necessary data. The LPA covers a very wide range of measurable variables that can be used to determine whether it is being implemented by the countries, and if not, why not (see list of

statistical data required for monitoring and evaluating the implementation of LPA annexed to document ST/ECA/PSD.2/5). Collecting all these data will obviously be a difficult undertaking for national statistical services in Africa. To take up this challenge, the statistical services will have to be reorganized along completely new lines taking into account the financial resources and skilled manpower at their disposal. Such a reorganization will have to cover not only the hierarchy of functions but also the apparatus of the statistical services.

Collection of statistical data

20. It is within the context of this function that survey, census or administratively filed data are collected and processed. So burdensome is the collection exercise that it would appear reasonable to try to take advantage of all collection activities conducted by public and private agencies alike. At the same time, the interface between these agencies will have to be organized and this brings in the idea of a network.

21. There seems to be no other way to collect statistical data than to do it in an integrated manner through a genuine national data-collection network drawing on two sources: the launching of appropriate surveys and information from administrative authorities. The nucleus of such a network would be the central bureau of statistics which would be provided with a survey unit having adequate equipment and specialists. The other elements of the network would be made up of ministries and public departments having statistical units that collect and circulate statistical information. This presupposes, however, that definitions, classifications and methods should be standardized in order to facilitate the establishment of an integrated statistical system which could be used not only to describe precise characteristics (absolute values) but also values grouped together as indicators of allied phenomena. The central bureau of statistics should play the role of promoter and director in this case.

Launching of appropriate surveys

22. Even though in-depth studies based on complete enumeration have great advantages, the disadvantages outweigh them when the studies are being conducted as a follow-up and evaluation exercise. The reason is that the scope of these studies makes them a burdensome exercise, and the results take a long time to prepare. Their usefulness for monitoring and evaluating a project is therefore fairly limited. This is why it becomes important, when statistical data have to be secured for monitoring and evaluating the implementation of the LPA, to resort to limited sample surveys based on a small correctly stratified sample and to resolve a set of methodological problems (the substance of the concept should reflect realities in Africa and be precise enough to be measured). Greater attention should be paid to the organization of surveys spaced out in time on the basis of eight-to-ten-year cycles, a certain percentage of variables from the area to being investigated by annual survey with a view to covering all the variables by the end of the cycle.

Administrative sources

23. In the current African context, the organization of a national statistical data collection network should be based on the principle of satisfying demand at relatively little cost through the use of inexpensive methods. First among such methods is the use of administrative sources, which in a number of cases provide information at a relatively modest marginal cost. The performance of certain administrative functions generates what is termed operational or management information.

24. In this regard, several kinds of systems (depending on the complexity of the function performed) can be distinguished. The degree to which these systems automatically generate such information varies depending on whether the systems have evolved from simple administrative functions or were developed to provide planning inputs. As an example of this, one need only recall that by securing the accounts and balance sheets of enterprises from the income tax department, specific surveys can be avoided, and that the essential data on health, education and housing can be secured from the public authorities. In any case, even if it is not yet fully harnessed, the potential of information coming from the public authorities should be further explored and statisticians should participate more systematically in the administration of management data in order to be more closely associated with the designing of files or in order to be able to modify concepts and definitions.

25. When drawing on administrative sources, statisticians should obviously make sure that the data provided are useful by ascertaining to what extent the data are up to date and accurate and whether the categories to which they relate correspond to those used in monitoring and evaluating the implementation of LPA.

Analysis and interpretation of statistical data

26. This is the function of the African statistical system which is least developed to date. In view of the demands that socio-economic decision-makers are making on the statistical system, data analysis and interpretation should receive greater attention on the part of national statistical services. Within the context of such analysis, data are interpreted from a descriptive point of view (descriptive statistical analysis and from a more specialized and mathematical point of view (explanatory statistical analysis). The first analyses data variable by variable and uses as the main instrument for measuring general trends such concepts as means, variants, medians, and ratios. The second considers the relationships between variables. Explanatory analysis can use more or less complex methods. The basic principle for establishing relationships is by association. However, association does not indicate a cause-effect relationship. This can be determined only with statistical, econometric and operational research techniques.

27. The data analysis should be as fast and efficient as possible, because incomplete or outdated data serve no useful purpose for decision-making. Since the basic data are collected when LPA is supposed to be in the process of implementation, descriptive analysis can be used to assess the degree of implementation by comparing results with set objectives. The outcome of such an analysis will determine what thrust should be given to the explicatory analysis.

28. From the standpoint of developing the analytical activities of national statistical offices, the widespread use of modern analytical methods is of primary importance. Two types of data processing services are particularly necessary for carrying out analyses:

- (a) General programmes (general interfaced summing and statistical software)
- (b) Simultaneous access to the data of several surveys (data banks).

Dissemination of data

29. Statistical information has no value unless it is received by the user. Dissemination is therefore an important function in the statistical information system. National bureau of statistics should devote the necessary resources in terms of manpower and equipment to this function. In this respect, the enquirer should be provided with just what information meets his needs out of a tremendous mass of information. To respond better to such enquiries, a statistical institute should be able to forecast the enquiries that will be addressed to it and constitute a corresponding stock of information classified in order to facilitate retrieval.

30. These problems can be solved by information science, which permits automation of publication systems and provides the means of setting up direct access macro-data banks and of transmitting statistical information stored on magnetic tape off-line. Communication of results is a crucial phase in the monitoring and evaluation process because it marks the time when research leads to decision-making. Users should be sufficiently familiar with the procedures and techniques of sample selection and the techniques of data collection and analysis in order to have some idea of the reliability and validity of the information secured.

Planning and control

31. While the planning of economic and social activities has become the rule almost everywhere in Africa, it is somewhat surprising to note that statistical activity in Africa is still divorced from planning. And yet, detailed and continual planning is essential in statistics because it makes for effective use of available resources and thereby strengthens capabilities and gives an orientation and purpose to the development of statistical activity. Given the serious shortage of skilled manpower and other resources in the field of statistics, it is particularly important for African countries to plan for the development of their statistical activities in order to secure maximum returns. New functions of planning and internal control should be instituted within national central bureau of statistics.

32. The main objective of such planning would be to institute a complete integrated system of socio-economic statistics which would provide appropriate and first-rate information for decision-making, analysis and research. It should be based on the use of methods for establishing priorities, the effective use of programmes and maximum exploitation of all available resources. It should include procedures for control and evaluation of progress being made towards objectives in any area of government service. The planning unit could also be asked to set standards, provide standard definitions for the collection of information, and periodically review the statistical activities of other agencies.

The programme co-ordination function

33. This function could be said to be externally located because it concerns the whole process of producing statistics in a country and requires the participation of various economic agents. In most African countries, the co-ordination of statistical activities is insignificant, not to say non-existent. Even where such co-ordination exists, it does not always function effectively. And yet co-ordination is of primary importance because it helps to:

- (1) identify and evaluate statistical requirements at the national level and strike a compromise among the needs of various users;

- (ii) adapt statistics to needs as and when they make themselves felt;
- (iii) co-ordinate effectively the activities of the various national agencies and institutions collecting and disseminating statistical information, thereby avoiding duplication and harmonizing the statistics produced;
- (iv) prepare a rational programme for the development of statistics at the national level and have such a programme incorporated in the national development plan;
- (v) scrutinize and comment on budgets relating to statistical operations;
- (vi) strike a balance between the various areas and work out the most effective means of collecting, analysing and presenting data;
- (vii) ensure that the information available is used to best advantage.

34. The composition of a national co-ordinating committee obviously depends on the structure of each country but it would be advisable for it to include all the parties concerned: the various ministerial departments, representatives of business, trade unions, universities and researchers.

35. The work of the co-ordinating committee will be linked to that of the planning department. Indeed, there is every reason to ensure that the guidelines in the area of statistics conform to the decisions taken in social and economic affairs. To this end, several sub-committees drawing on the services of experts could be set up to consider specific problems.

V. CONCLUSIONS

36. In this study, an attempt has been made to underscore the importance of statistical information in the taking of political, economic and social decisions, and to describe the problems that national statistical services in Africa should solve in order to meet to the challenge. In order to be able to analyse the situation it is facing on the international scene, grasp recent trends and forecast coming trends, appreciate its strength and weaknesses in the economic and social fields, every Government is obliged to use statistics which constitute the State's store of knowledge.

37. For the national bureaux of statistics responsible for assembling this body of knowledge, the daunting problem they face is to know how and where to collect the data that must be accumulated for the needs of national communities. The answer to this question lies in the formulation of a strategy based on the principle of producing statistics along with methods for analysis, interpretation and dissemination that are geared to genuine needs.

38. In this regard:

- (i) Priorities in statistics should derive from the major national economic and social priorities. Accordingly, a mechanism for consultation at the national level, invested with a measure of authority, should be instituted;

- (ii) Much attention will have to be paid to the organization of the statistical system itself. A certain degree of decentralization in the substantive ministries will have to be adopted and put into effect, because this can promote the development of the statistical information system in certain areas and make for better implementation of decisions regarding sectoral priorities;
- (iii) Basic mechanisms will have to be instituted for collecting data in the selected areas of concern at reduced cost. In this regard:
- the traditional methods must be reviewed because of the substantial costs involved and a shift made towards more specific and more intensive operations which will give high quality data. Given the fact that random sampling involves high costs to ensure representativity, recourse will have to be made to the use of voluntary samples which are sufficiently close to random samples;
 - administrative data bases comprising a more complete description of the units and using more variables for statistical purposes will have to be established. It is essential for this purpose on the one hand, to involve the statistician sufficiently early in the process of constituting such data bases and on the other hand, to accord priority to information science in statistical system and re-structure the whole process of producing statistics into one global data bank which will cover all the functions in a homogeneous manner.
- (iv) In order to secure good figures, the greatest care will have to be taken in specifying the concepts and definitions on the basis of which data are collected. In this area, co-operation between statisticians and economists will have to be instituted and strengthened.